**Describing and Explaining Enthalpy changes**

**1. (a)** The equation for Δf *H* ° of H2O(l) is:

H2(*g*) + ½O2(*g*) → H2O(l) −286 kJ mol–1

(i) Write the equation for Δc*H* ° (H2(*g*)).

(ii) Using the equations above, explain why Δc*H* ° (H2) and Δf *H* ° (H2O) have the same value of −286 kJ mol–1.

**(b)** The enthalpy of formation would change if the water was formed as a gas rather than a liquid.

(i) Circle the correct phrase to complete the sentence below.

Δf *H* ° (H2O(*g*)) is: less negative than / the same as / more negative than Δf *H* ° (H2O(l)).

(ii) Justify your choice.

**2.** Explain what is meant by the term Δvap *H* ° (H2O(*ℓ*)).

**3. (i)** Write an equation for the reaction that represents the heat of combustion of sulfur (S, *s*).

**(ii)** Explain why (S, *s*) and (SO2, *g*) have the same value.

**4 (i)** Explain what is meant by the symbol Δc*H* °

**(ii)** Write the equations which represent the enthalpy of fusion, Δfus*H* °, and vaporisation, Δvap*H* °, for

water.

**(iii)** Explain why Δvap*H* °(H2O) = 40.7 kJ mol–1 is greater than Δfus*H* °(H2O) = 6.01 kJ mol–1.

In your answer you should include:

• a description of the attractive forces between the molecules in the different phases (states) of water

• a discussion of how these forces relate to the given enthalpy values.

**5. (i)**Explain what is meant by the term Δvap*H* °.

**(ii)** Explain why Δf *H* ° (CO2(*g*)) and Δc *H* (C(*s*)) have the same value of −394 kJ mol−1.

**6. (i)** Write the equation for which the enthalpy change is the enthalpy of formation, Δf *H*°, for zinc oxide.

**(ii)** Write the equation for which the enthalpy change is the enthalpy of fusion, Δfus*H*°, for zinc sulfide.

**(iii)** Give a reason why Δfus*H*° is always greater than zero.

**7.** Define the term Δvap*H* °.

**8.** Urea, (NH2)2CO, which is a white crystalline solid, is widely used as a fertiliser. Write the equation

for which the enthalpy change is:

**(i)** the enthalpy of formation, Δf*H*°, for urea

**(ii)** the enthalpy of fusion, Δfus*H*°, for urea

**9.** Write the equation for the reaction that has an enthalpy change given by Δf*H*(HCl, *g*).

**10. (i)** Write the equation for the reaction that has an enthalpy change equal to Δc*H* (H2, *g*)

**(ii)** Explain why Δf*H*(H2O, *ℓ*) is equal to Δc*H*(H2, *g*).

© 2015 <http://www.chemicalminds.wikispaces.com>

NCEA questions and answers reproduced with permission from NZ